SPECTROSCOPIA MOLECULAR

Un bulletin mensual de novas e informationes de interesse e valor al spectroscopistas molecular

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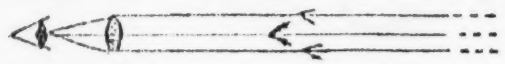
LE HABITUDE DE COMMITTER nostre pensatas al scripto es un medio potente de expander le mente e de producer un arrangiamento logic e systematic de nostre vistas e opiniones. Il es isto que da al scriptor un vaste superioritate supra le mer parlator in re le correctessa e le extension de su conceptiones. Nemo pote jammais sperar cognoscer le principios de alicun arte o scientia completemente qui non scribe tanto como lege super le subjecto.

-- BLAKEY.

NOVE DISVELOPPAMENTOS



**CHLORIDO DE POLYVINYLIDENO. Le spectro infrarubie ha essite obtenite inter 2,5 e 100 μ. Mesurationes de polarisationes esseva facite inter 2,5 e 33 μ de un copolymero orientate con le chlorido de polyvinylo que contine plus que 85 per cento del chlorido de polyvinylideno. Le similaritate del spectros permitteva un correlation inambigue con le bandas del chlorido de polyvinylideno pur. Le structura detaliate de iste polymero non es establite usque nunc. Un assignation satis complete del bandas infrarubie ha essite facite. (S. KRIMM e C. Y. LIANG, Bul. Am. Phys. Soc. 30, 24 (1955); Universitate Michigan, Ann Arbor, Michigan, Statos Unite)

**POLYTETRAFLUOROETHYLENO. Le spectro infrarubie inter 2,5 e 100 μ, e le dichroismo del film orientate inter 2,5 e 33 μ esseva obtenite. Le regulas de selection esseva derivate sur le base de un structura helicoidel. Le fundamentales infrarubie esseva assignate. (C. Y. LIANG e S. KRIMM, ibid. 30, 25 (1955).)

**SPECTROS EMISSIONIC. Conditiones de basse excitation esseva producite in un discarga a alte frequentia sin electrodos, al plus grande pressiones que es possibile. Le intensitates es sufficientemente grande pro permitter le studio del spectros a alte resolution. Studiate es acetaldehydo, acetono, benzaldehydo, acetophenona, biacetylo, e naphthaleno. (G. W. ROBINSON, ibid. 30, 27 (1955); Universitate Johns Hopkins, Baltimore, Maryland, Statos Unite.)

* * *

**INTENSITATES VIBRATIONAL. Ha essite mesurate le intensitates de linea integrate del bandas de absorption 1-0 e 2-1 de HCl e del banda 1-0 de DCl. Alte resolution esseva usate. Isto permitteva mesurationes del lineas isotope individual de H^1Cl^{35}, H^1Cl^{37}, H^2Cl^{35}, e H^2Cl^{37}. Le resultatos indica que pro parve vibrationes le cargas es essentialmente punctic. (R. HERMAN, G. E. MOORE, S. SILVERMAN, e R. F. WALLIS, ibid. 30, 27 (1955); Laboratorio de Physica Applicate, Universitate Johns Hopkins, Silver Spring, Md., S. U.)

* * *

**LARGOR DE LINEAS VIBRATIONAL. Labor previe (E. Lindholm, Z. Physik 109, 223 (1938); Benedict e Silverman, Phys. Rev. 94, 752 (1954)) ha monstrate que le largor de collision del lineas vibrational rotational de HCl varia considerabilemente con le numero quantic rotational, e que le absorption a numeros de undas plus grande que plure K (kaysers, cm^{-1}) ab le position de resonantia es plus grande que lo requirite per le forma Lorentz. Nos ha investigate iste effectos plus completemente. A nostre altissime densitate optic, il ha absorption quasi complete al centro del banda 1-0. Le coefficiente de absorption proxime al origine del banda es plus que 3 vices si grande como predicite ex le forma Lorentz e le largores obtenite a densitates plus basse. Le deviationes non del typo Lorentz pare esser proximemente symmetric secundo cata linea e pare esser maximal pro le lineas de minime J. Le largores de linea observate pro omne valores de J, a omne temperaturas, pro HCl e DCl, es plus grande que illos calculate pro dipolos resonante. Isto monstra le importantia del interactiones nonresonante de dipolo-dipolo, dipolo-quadrupolo, e possibilimente alteres de plus grande ordines. (W. S. BENEDICT, G. E. MOORE, e S. SILVERMAN, 30, 28 (1955); Universitate Johns Hopkins, supra-date adresse.)

* * *

**SPECTRO MICROUNDIC DE $N^{15}O^{16}$. Le prime 2 transitiones rotational $J = 1/2 \rightarrow 3/2$ e $3/2 \rightarrow 5/2$ de $N^{15}O^{16}$ in le stato electronic normal $^2\pi_{\frac{1}{2}}$ ha essite mesurate in le region de $\lambda = 1$ a 2 mm. Constantes rotational es $B_o = 49043{,}86$ Mc/sec e $D_o = 0{,}14$ Mc/sec. Constantes del structura hyperfin es $D = -131{,}90$ Mc/sec e $d = -157{,}98$ Mc/sec. Isto es explicate per le theoria de Frosch e Foley. Le previe μ de N^{15} es correcte. (J. J. GALLAGHER, W. C. KING, e C. M. JOHNSON, ibid. 30, 28 (1955); Universitate Johns Hopkins, Baltimore, Md., S.U.)

SPECTROS MOLECULAR.III.
TRACTAMENTOS DEL COORDINATAS NORMAL DE MOLECULAS POLYATOMIC
B. APPLICATIONES SPECIFIC

Forrest F. Cleveland, Arnold G. Meister, e Fred L. Voelz
Instituto Technologic de Illinois, Chicago 16, Illinois

(continuate ab Spec.Mol. 4, 24 (1955) - Parcella No.3)

2C. Le Matrices G

WILSON[5] ha demonstrate que le elementos de un forma modificate del matrice de energia cinetic pote esser obtenite, si solmente vibrationes nondegenerate es presente, ex le equation

$$G_{jl} = \sum_p \mu_p g_p \underline{S}_j^{(t)} \cdot \underline{S}_l^{(t)}; \qquad (1)$$

j e l designa le coordinatas de symmetria usate in le obtention del vectores $\underline{S}$, p designa un gruppo de atomos equivalente del qual un atomo typic es t, μ es le reciproco del massa del atomo t, g_p es le numero de atomos equivalente in le gruppo p, e le summation se extende super omne le gruppos de atomos equivalente in le molecula. (Per exemplo, le 2 atomos H in le H_2O forma un gruppo equivalente.)

Le vectores $\underline{S}$ es date per

$$\underline{S}_j^{(t)} = \sum_k U_{jk} \underline{s}_{kt}; \qquad (2)$$

j, U_{jk}, e $\sum_k$ ha le mesme significa-tion como in Eq. 2A4. Le vectores $\underline{s}_{kt}$ pote esser exprimite in terminos de vectores unitari secundo le ligamines chimic (Fig.2C1). Si $\underline{y}'$ es un vector unitari que se dirige secundo le ligamine ab le atomo t al atomo t', e si r_k es le cambiamento in le longitude de iste ligamine ab su valor de equilibrio, tunc, secundo Wilson[5],

$$\underline{s}_{kt} = -\underline{y}', \quad \underline{s}_{kt'} = \underline{y}'. \qquad (3)$$

Sed si r_k es le cambiamento in le angulo interligaminic α (Fig.2C1) tunc le vectores del atomos terminal es

$$\underline{s}_{kt'} = (\cos\alpha\, \underline{y}' - \underline{y}'')/(d' \sin\alpha) \quad (4)$$

$$\underline{s}_{kt''} = (\cos\alpha\, \underline{y}'' - \underline{y}')/(d'' \sin\alpha); \quad (4)$$

e pro le atomo del apice,

$$\underline{s}_{kt} = \left[(1/d'' - \cos\alpha/d')\, \underline{y}' + (1/d' - \cos\alpha/d'')\, \underline{y}''\right]/\sin\alpha. \qquad (5)$$

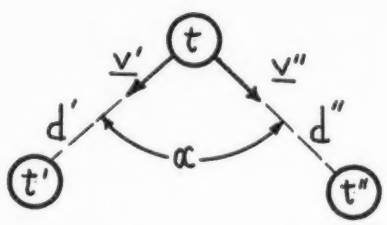


Fig. 2C1. Vectores unitari $\underline{y}'$ e $\underline{y}''$ dirigite ab le atomo t al atomos t' e t'', respectivemente, secundo le ligamines d' e d'' que forma le angulo interligaminic α.

Pro le molecula H_2O, t' = H_1, t = O, t'' = H_2, e d' = d'' = d_1 = d_2 = d. Assi le vectores $\underline{s}_{kt}$ pro H_1 e O es

$$\underline{s}_{d_1H_1} = \underline{y}',$$

$$\underline{s}_{qH_1} = (\cos\alpha\, \underline{y}' - \underline{y}'')/(d \sin\alpha),$$

$$\underline{s}_{d_1O} = -\underline{y}', \qquad \underline{s}_{d_2O} = -\underline{y}'',$$

$$\underline{s}_{qO} = \left[(1 - \cos\alpha)(\underline{y}' + \underline{y}'')\right]/(d \sin\alpha).$$

Proque H_1 e H_2 es atomos equivalente, il non es necessari calcular le vectores de H_2.

Pro obtener le vectores $\underline{S}_j^{(t)}$ ex Eq. 2, le valores del U_{jk} es necessari. Ex Eqs. 2A1-2A3, istos es

$$U_{1d_1} = 2^{-\frac{1}{2}}, \quad U_{2d_1} = 0, \quad U_{3d_1} = 2^{-\frac{1}{2}}$$

$$U_{1d_2} = 2^{-\frac{1}{2}}, \quad U_{2d_2} = 0, \quad U_{3d_2} = -2^{-\frac{1}{2}},$$

$$U_{1\alpha} = 0, \quad U_{2\alpha} = 1, \quad U_{3\alpha} = 0.$$

Assi le vector $\underline{S}_1^{H_1}$ es

$$\begin{aligned}\underline{S}_1^{H_1} &= U_{1d_1}\underline{s}_{d_1H_1} + U_{1d_2}\underline{s}_{d_2H_1} \\ &\quad + U_{1\alpha}\underline{s}_{\alpha H_1} \\ &= 2^{-\frac{1}{2}}\underline{y}' + 2^{-\frac{1}{2}}(0) \\ &\quad + (0)(\cos\alpha\,\underline{y}' - \underline{y}'')/(d\sin\alpha) \\ &= 2^{-\frac{1}{2}}\underline{y}';\end{aligned}$$

$\underline{s}_{d_2H_1}$ es zero proque un cambiamento in d_2 non involve H_1. Similemente

$$\underline{S}_2^{H_1} = (\cos\alpha\,\underline{y}' - \underline{y}'')/(d\sin\alpha),$$

$$\underline{S}_3^{H_1} = 2^{-\frac{1}{2}}\underline{y}',$$

$$\underline{S}_1^{0} = -(\underline{y}' + \underline{y}'')2^{-\frac{1}{2}},$$

$$\underline{S}_2^{0} = (1 - \cos\alpha)(\underline{y}' + \underline{y}'')/(d\sin\alpha),$$

$$\underline{S}_3^{0} = (\underline{y}'' - \underline{y}')2^{-\frac{1}{2}}.$$

Le matrice G pro le vibrationes del typo a_1 contine solmente le elementos G_{11}, G_{12}, G_{21}, e G_{22}, proque solmente S_1 e S_2 pertine al vibrationes a_1. Ex Eq. 1, le elemento G_{11} es

$$\begin{aligned}G_{11} &= \mu_H g_H \underline{S}_1^{H_1}\cdot\underline{S}_1^{H_1} + \mu_0 g_0 \underline{S}_1^{0}\cdot\underline{S}_1^{0} \\ &= \mu_H(2)(2^{-\frac{1}{2}}\underline{y}')\cdot(2^{-\frac{1}{2}}\underline{y}') + \\ &\quad \mu_0(1)\left[-(\underline{y}' + \underline{y}'')2^{-\frac{1}{2}}\right]\cdot\left[-(\underline{y}' + \underline{y}'')2^{-\frac{1}{2}}\right] \\ &= \mu_H(\underline{y}'\cdot\underline{y}') + \tfrac{1}{2}\mu_0\left[(\underline{y}'\cdot\underline{y}') + \right. \\ &\quad (\underline{y}'\cdot\underline{y}'') + (\underline{y}''\cdot\underline{y}') + \left.(\underline{y}''\cdot\underline{y}'')\right] \\ &= \mu_H + \mu_0(1 + \cos\alpha),\end{aligned}$$

proque $g_H = 2$, $g_0 = 1$, $\underline{y}'\cdot\underline{y}' = \underline{y}''\cdot\underline{y}'' = 1$, e $\underline{y}'\cdot\underline{y}'' = \underline{y}''\cdot\underline{y}' = \cos\alpha$.

Le altere elementos de matrice es obtenite ex Eq. 1 in un simile maniera. Assi le matrice G pro le vibrationes de typo a_1 es

$$\begin{pmatrix} G_{11} & G_{12} \\ G_{21} & G_{22} \end{pmatrix},$$

ubi

$$G_{11} = \mu_H + \mu_0(1 + \cos\alpha),$$

$$G_{12} = G_{21} = (-2^{\frac{1}{2}}\mu_0\sin\alpha)/d,$$

e

$$G_{22} = 2\left[\mu_H + \mu_0(1 - \cos\alpha)\right]/d^2.$$

In general, $G_{jl} = G_{lj}$.

Le matrice G pro le vibration de typo b_1 contine solmente le elemento G_{33}, proque solmente S_3 pertine a iste typo de vibration. Ex Eq. 1,

$$G_{33} = \mu_H + \mu_0(1 - \cos\alpha).$$

Le matrices G etiam pote esser obtenite ex tabulas[8,9] como explicate plus tarde.

(Va continuar in un numero futur.)

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[8] J. C. Decius, J. Chem. Phys. 16, 1025 (1948).

[9] E. B. Wilson, Jr., J. C. Decius, e P. C. Cross, Molecular Vibrations (McGraw-Hill Book Company; New York, Toronto, London; 1955), p. 303.

NOVAS

IE COBLENTZ SOCJETY ha essite organisate per le committee super spectroscopia infrarubie formate al symposio Ohio State in junio 1954. Le objectivo del societate es promover le comprehension e application del spectros infrarubie. Pro plus informationes, scribe a Dr. V. Z. Williams, Registrar, COBLENTZ SOCIETY, c/o Perkin-Elmer Corporation, Norwalk, Conn., Statos Unite.

* * *

ERROR: In le summario del articulo per Thomas, Sherrard, e Sheridan in Spec. Mol. 4, 5 (1955) le prime 2 lineas sub le tabula deberea esser: Le concordantia es si bon que le variationes in le angulo H-C-H es extra le error probabile.

(continuate al pagina 31)

SUMMARIOS DE ARTICULOS FUTUR

Evalutation del Constantes de Fortia ex Datos del Effecto Raman. Parte 1: Moleculas e Radices del Typo XY_4. K. VENKATESWARLU e S. SUNDARAM. Universitate Annamalai, Annamalainagar, Sud-India. Submittite al J. Chem. Phys. le 11 de martio 1955.

CONSTANTES DE FORTIA de 8 radices e 6 moleculas del typo XY_4 que pertine al symmetria T_d ha essite calculate ex le datos Raman per le methodo de matrices F e G de E. B. Wilson. Per uso del regulas empiric de Badger e Gordy, le distantias internucleari X-Y ha essite calculate e comparate con le valores experimental.

Parte 2: Moleculas e Radices del Typo XY_3 Planar.

CONSTANTES DE FORTIA de 4 moleculas e 5 radices del typo XY_3 planar que pertine al symmetria D_{3h} ha essite calculate, usante le datos del effecto Raman e le methodo de E. B. Wilson. Le distantias internucleari X-Y ha essite calculate per uso del regulas empiric de Badger e Gordy.

NOVAS, continuate ab pagina 30

TRADUCTIONES COMPLETE in anglese del Bulletin del Academia de Scientias del USSR es disponibile ab Columbia Technical Translations, 561 W. 141st St., New York 31, N. Y., S. U. Traductiones individual ex russe, francese, e german etiam es disponibile a $20 per 1000 parolas.

* * *

SPECTROGRAPHO USATE pro vendita. ARL, grilliage a 1,5 m, con accessorios. Departimento de Chimia, Pomona College, Claremont, Calif., Statos Unite.

* * *

G. HERZBERG, chef del division de physica del Consilio National de Recerca de Canada, ha essite eligite como Fellow honorari del Academia Indian de Scientias in recognition de su contributiones extraordinari al saper, e su eminentia scientific.

(continuate al pagina 32)

SUMMARIOS DE DISCURSOS

Energias de Dissociation de Moleculas Diatomic Pesante. J. G. WINANS. Universitate Wisconsin, Madison, Wis., S. U. Presentate al seminario de physica chimic al Universitate Chicago le 14 de februario 1955.

MOLECULAS IN ALICUN vapores e mixturas de vapores pote esser detegite solmente per lor spectros de emission e absorption. Pro le vapor de Hg, $\gamma = c_p/c_v = 1{,}666 \pm 0{,}002$ e isto significa que le energia de dissociation de Hg_2 es parve. Mesurationes per Franck e Grotrian, Koernicke, e Kuhn e Frendenberg del intensitates in le banda de Hg_2 a 2540 Å pro 2 temperaturas duce a $D(Hg_2) = 0{,}07$ ev.

Spectros de absorption de Zn_2, Cd_2, e Hg_2 -- e, como demonstrate per Margrave, etiam de Mg_2 -- monstra un accrescimento in le largessa del linea simplette de resonantia in un region large de absorption con un limite acute a parve longitudes de undas in un banda de absorption, como monstrata in Fig. 1. Le

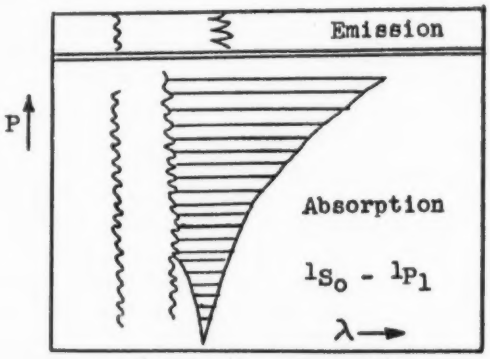

Fig. 1. Absorption al linea de resonantia (P = pression, λ = longitude de undas).

banda al limite a parve longitudes de undas non esseva presente in emission in un discarga Tesla pro Hg_2, Cd_2, e Zn_2.

Interpretation del limite acute a parve longitudes de undas como un limite de dissociation dava $D > 0{,}15$ ev pro

Hg_2. Mesurationes del intensitates a 2 temperaturas pro absorption in le banda 2345 Å de Hg_2 confirmava le valor D = 0,07 ev obtenite per alteros con le banda 2540 Å.

Le discrepantia inter le valores spectroscopic e thermooptic pote esser associate con le effecto del energia thermal, le qual esseva circa 0,07 ev pro le conditiones del experimentos. Mesurationes thermal da solmente le energia in addition al energia thermal necessitate pro dissociar, durante que le mesurationes spectroscopic da le energia total de dissociation.

Calculationes per London ex datos de dispersion da $D = 159/r_e^6 = 0{,}12$ ev pro $r_e = 3{,}3$ Å. Isto es in concordantia satisfacente con le limite le plus basse de 0,15 ev obtenite ex le spectro.

* * *

Iste summario esseva scribite per Dr. Winans al requesta del redactor. Altere spectroscopistas es precate inviar summarios de lor discursos pro publication in numeros futur.

NOVAS, continuate ab pagina 31

LE HOROLOGIO MOLECULAR de Townes et al. es describite in un articulo excellente in Chem. Eng. News 33, 502 (1955). Isto varia non plus que 1 sec in 300 annos.

* * *

R. S. MULLIKEN del Universitate Chicago essera pro un anno un attaché scientific al ambassada statounitese in London

* * *

GRADOS AVANTIATE recipite in januario per spectroscopistas al Instituto Technologic de Illinois es:

Doctor of Philosophy: James P. Zietlow
Milton Ash, e Fred L. Voelz.

Master of Science: Jerome M. Dowling
e Arthur N. Takata.

* * *

LE 2nde CONFERENTIA del spectroscopistas del statounitese west-costa esseva tenite al Instituto Technologic de California in Pasadena al 3-4 de februario 1955. Discutite esseva intensitates absolute e le spectros e structura de moleculas grande.

(Per favor, invia novas al redactor.)

CONFERENTIA SUPER SPECTROSCOPIA MOLECULAR

UN CONFERENTIA SUPER spectroscopia molecular, sub le egide del Hydrocarbon Research Group del British Institute of Petroleum, esseva tenite in London le 28 e 29 de octobre 1954. 20 discursos, del quales exemplares ha essite circulate in avantia, esseva presentate e discutite. Istos includeva contributiones academic e industrial que coperi multe aspectos de spectroscopia currente.

Le participation esseva alte e de nove esseva representative de multe interesses. Forsan a causa del presentia de un grande numero de spectroscopistas del typo "pan e butyro", le discussion se centrava circa le grandissime utilisation del datos spectral.

Le themas principal durante le intervallos de discussion esseva problemas del arrangiamento e sortir del datos spectroscopic, e le transferentia de mesurationes de intensitate inter spectrometros differente.

H. W. Thompson del Universitate Oxford revideva le stato del labor super cartas puncturate in America e Grande Britannia, e un contribution ab Dr. Kaiser sublineava le base de un systema elaborate in Germania. Un monstra de manos indicava que spectros esserea contribuite in numeros substantial a un systema general de cartas puncturate.

Van Zandt Williams (Statos Unite) da un pictura comprehensive del applicationes presente de spectrometros commercial al analyse industrial e sublineava le necessitate de un parametro valide in spectrometria, forsan altere que absorption, pro labor futur. Nonobstante, post le discurso super le intensitates de bandas vibrational de absorption, interesse considerabile esseva monstrate in le meritos del analyse e diagnose structural per areas integrate del banda.

Alicunes del applicationes possibile que sequerea le disveloppamento de spectrometros diffractionic robuste de alte resolution esseva indicate. E affinamentos que poterea esser obtenite

per uso de crystallos colorate de halidos de alcali como filtros esseva describite.

Resultatos obtenite per le uso del spectrometro Raman como utensil industrial in le analyse de currentes de processo de petroleo esseva reportate per Dr. Budenbostel (S. U.).

Interesse considerabile esseva monstrate in le methodos sublineate per W. C. Price del Universitate London (G.B.) pro le examination de specimens solide e pro le obtention del spectros de emission e reflexion in le infrarubio.

Studios spectroscopic includeva contos in re alicun aromaticos monodeuterate per Dr. Kunst (Hollanda); de reactiones a alte temperaturas per Prof. Hornig (Univ. Brown, S. U.); del determination de hydrocarburos aromatic in fractiones de oleo lubrificante per spectroscopia ultraviolette ultime per R. A. Burdett (S. U.); de observationes super le proprietates de oxydation de oleos hydrocarburic mineral per Prof. Luther (Germania); e de hydrocarburos sub alte potentia de resolution per H. W. Thompson.

Technicas a basse temperaturas como applicate al spectroscopia infrarubie, le typos de cella usate a iste temperaturas, e le cambiamentos spectral producite con un cambiamento de stato, esseva discutite per N. Sheppard (Univ. Cambridge, G. B.).

Un pecia convincente de demonstration facilitava un comprehension del mechanismo del spectros resonantic magnetic nucleari como describite per R. E. Richards (Univ. Oxford).

Le proceduras complete del conferentia, includente discussiones e reimpressiones, essera publicate per le Institute of Petroleum, London, G. B.

G. L. ROSS
Secretary, Spectroscopic Panel
Hydrocarbon Research Group
The British Petroleum Company Ltd.
Research Station
Chertsey Road
Sunbury-on-Thames, Anglaterra

(Preparate al requesta del redactor.)

NOVE LIBROS 7

Molecular Vibrations -- The Theory of Infrared and Raman Vibrational Spectra (Vibrationes Molecular -- Le Theoria del Spectros Vibrational Infrarubie e Raman). E. B. WILSON, Jr., J. C. DECIUS, e P. C. CROSS. McGraw-Hill Book Company, 330 W. 42nd St., New York 36, N. Y. (etiam Toronto e London), 1955. 388 + xi paginas, $8.50.

ISTE OBRA COPERI comprehensivemente le theoria del vibrationes de moleculas polyatomic e le applicationes de iste theoria al interpretation del spectros Raman e infrarubie. Es disveloppate le elementos essential del theoria, comenciante ab su simplicissime forma e avantiante a theoremas satis elaborate e potente que es usabile in le applicationes plus complicate.

Un serie potente de technicas mathematic, tal como le algebra de matrices e le theoria de gruppos, es introducite e explicate como necessitate. Technicas moderne pro uso del symmetria molecular pro simplificar le tractamento de problemas complexe es includite.

Iste libro va esser indispensabile a illes qui ha un interesse in spectros vibrational.

Infelicemente, appare etiam al prime pagina le expression incorrecte, "frequency of 250 wave numbers". Primo, 250 non es le frequency sed le wave number del radiation. Secundo, le unitate de wave number non pote esser etiam wave number.

Incorrecte:
(1) 250 wave numbers.
(2) 4358 wave lengths.

Correcte:
(1) 250 wave number units, o waves per cm, o kaysers.
(2) 4358 angstroms.

Per consequente, le expression deberea haber essite: "wave number of 250 kaysers".

Scientistas debe esser justo si exacte in lor expressiones linguistic como in le obtention e le analyse del datos o in le disveloppamento del theoria. Pro, post toto, lor objectivo es transmitter conceptos accurate al lector.

CALENDARIO

Maio 6. Association American de Spectrographos, 6te conferentia annual, in Chicago, Applicationes industrial de spectroscopia. Spectros emissionic e absorptionic, e del fluorescentia de radios x. (F. Stedman, Corporation Bendix Aviation, 401 Bendix Drive, South Bend 20, Indiana, Statos Unite.)

Maio 26-27. Societate pro Spectroscopia Applicate, 10me symposio annual e exhibition, New York.

Junio 13-17. 10me symposio annual super spectroscopia e structura molecular. (H. H. Nielsen, Departimento de Physica, Universitate Ohio State, Columbus 10, Ohio, Statos Unite.)

Julio 7-11. Convention de Spectroscopistas Molecular Europee, Oxford, Anglaterra. Spectroscopia ultraviolette absorptionic, Raman e infrarubie includente nove disveloppamentos in tecnicas, spectros vibrational de moleculas complexe, mesurationes con alte resolution, spectros de flammas, campos de fortia, spectros de crystallos, e le infrarubie remote. (H. W. Thompson, St. John's College, Oxford, Anglaterra.)

Julio 18-29. Programma intensive de spectroscopia infrarubie. (R. C. Lord, Laboratorio de Spectroscopia, Instituto Technologic de Massachusetts, Cambridge Massachusetts, Statos Unite.)

Septembre 14-16. 2nde symposio Ottawa super spectroscopia applicate. (J. K. Hurwitz, Branca de Minas, 568 Booth St. Ottawa, Ontario, Canada).

Junio 1956. Convention del Commission Juncte pro Spectroscopia. Columbus,Ohio o Washington, D. C., S.U. (W. F. Meggers, Bureau National de Standards, Washington 25, D. C., Statos Unite.)

Autumno 1956. 6te colloquio international de spectroscopia. Hollanda. (D. M. Smith; Johnson, Matthey, and Company Ltd., Wembley, Anglaterra.)

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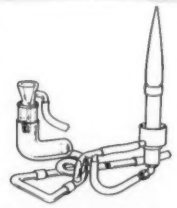

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